DOCUMENT RESUME

ED 466 451 SP 040 865

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TITLE	Preservice Teacher Standards and the MAGNETIC CONNECTIONS Electronic Portfolio.
PUB DATE	2002-04-00
NOTE	17p.; Paper presented at the Annual Meeting of the American Educational Research Association (New Orleans, LA, April 1-5, 2002). Color figures may not reproduce adequately.
PUB TYPE	Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Computer Uses in Education; Elementary Secondary Education; Higher Education; *Portfolios (Background Materials); Preservice Teacher Education; Preservice Teachers; Teacher Role; *World Wide Web
IDENTIFIERS	*Electronic Portfolios

ABSTRACT

This article describes Web-based portfolio systems, examining what is known about implementing Web-based student portfolios. The first two sections address the culture and ideologies needed for successful implementation, discussing faculty role in the portfolio process and broadening the definition from a portfolio of student artifacts to a collaborative Web-based portfolio system. The third section describes the enhanced communications embedded in a Web-based portfolio system. The final section provides a checklist of 12 critical success factors needed to successfully implement the Webfolio system at the program and individual course level. The 12 critical factors are in the areas of information services cooperation; administrative support; technology infrastructure; portfolio culture; student learning centered culture; implementing force and project champions; implementation milestones; training and help resources; faculty members who believe Webfolios will make a difference in the quality of education and understand their role in it; standards of competency-based curriculum; integrated curriculum developed by teams of faculty; and supervisors and mentors who use the Webfolio to provide feedback. (Contains 14 references.) (SM)

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Preservice Teacher Standards and the MAGNETIC CONNECTIONS Electronic Portfolio

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A paper presented at the American Educational Research Association (AERA) 2002 Annual Meeting, (Division K – Teaching, Teacher Education with and for Students and Teacher Learning) 1-5 April 2002, in New Orleans, Louisiana

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It is now 2009. A $1,000 personal computer can perform about a trillion calculations per second. Computers are imbedded in clothing and jewelry. Most routine business transactions take place between a human and a virtual personality. Translating telephones are commonly used. Human musicians routinely jam with cybernetic musicians. The neo-Luddite movement is growing. (Kurzweil, 1999, p. ix)

With Kurzweil providing a general sense of the promise of future technology, we pinpoint the focus of the discussion on electronic portfolios with our own description:

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It is now 2009. A webfolio system consisting of instructor assignments, learning resources, student artifacts, mentor feedback, and curriculum standards is used extensively throughout all levels of education. It also supports continuous curriculum improvement and allows all educators to share teaching and learning strategies, learning resources, and assignments with their colleagues. A collaborative community of learners evolves around the development and use of the webfolio system. Students respond to course and program standards and assignments by generating multimedia WWW documents (*artifacts*). Mentors' provide feedback on a student's work and the comments are kept as electronic logs and viewed only by the student who generated the artifact. A web-based system instantly organizes a student's work and presents the artifacts in a student webfolio; displaying not only the artifact, but also the associated assignments and activities. Any authorized webfolio user can assess the student's mastery of curricular standards. A student's webfolio starts in kindergarten, is continued through college, and archives a student's lifelong learning and career development; as well as, showcasing the newest and finest achievements in the student's life work.

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Most university and college faculty would expect web-based student portfolios to be commonplace six or seven years from now, but Kurzweil's opening quote can evoke questions in the reader's mind about some obstacles that will block the road to realizing his vision. Compared to Kurzweil's "embedding computers in clothing and jewelry, and interactions with virtual personalities," readers should find our statements about web-based portfolios to be pedestrian with any resulting controversy involving why fulfillment of our vision should take so long. Today there is considerable interest in moving from paper to electronic portfolios and there seem to be no apparent obstacles, certainly no technical obstacles. This was the view held by the authors when we began implementing web-based electronic portfolios at two institutions more than five years ago. After the initiation of more than four thousand web-based student portfolios, our experiences at our own institutions and our work with other institutions indicate the transition is not as easy as it seems and successful implementation depends on a set of critical success factors. In academic settings where some of the success factors are missing, expectations must be scaled back until the critical success factors are adequately addressed.

As developed in this article, a webfolio is a tightly integrated collection of web-based multimedia documents that includes curricular standards, course assignments, student artifacts in response to assignments, and reviewer feedback of students' work. In the authors' opinions it is the integrated collection and how the collection is stored and used that differentiates the webfolio from other paper and traditional electronic portfolios. The webfolio opens up new possibilities for observing and influencing the interaction between curriculum, students, and faculty.

The purpose of this article is to familiarize the reader with what a web-based portfolio system is and can do and convey what we have learned about implementing web-based student portfolios. The first two sections address the culture and ideologies needed for successful implementation. The third section describes the enhanced communications embedded in a web-based portfolio system, and the final section provides a checklist of critical success factors needed for the successful implementation of the webfolio system at the program and individual course level.

Cultural Issue I: ***We have met the enemy... and the enemy is us***

Since 1994, consider the dramatic change that has taken place in the web. Remember when there was very little content and all content was static. As mentioned in the introduction, most university and college faculty, extrapolating the tremendous change that has taken place in web development, would logically expect web-based student portfolios containing students' multimedia responses to assignments to be commonplace in a few years. Yet we wonder how this will happen when few instructors will, voluntarily, put their syllabi and assignments online or even take the initiative to help this happen. The dearth of literature regarding faculty use of electronic portfolios is testimony to this paradox.

The irony cascades when one realizes that the literature available on the use of electronic portfolios has more to do with students coming to terms with the technology than with the faculty using electronic portfolios to enhance teaching and learning. Most studies suggest that students are the problem because they do not have the necessary

technical skills to make the electronic portfolio work well. "A survey of the impact of this electronic environment on students' attitudes reveals that students continue to require significant introduction to the technology in order to overcome the associated anxiety." (MacKinnon, 1999, p. 1) Still, many studies tend to acknowledge the hardships encountered in implementing the electronic portfolio as worthwhile for the students. Jacobsen and Mueller (1998) reported, "The course instructors believe this teaching method, especially the electronic portfolio assignment, contributed to the development of highly marketable educational technology skills among participating students."

The crux of this irony is that portfolios are traditionally something that is done "to" students. Rarely is a portfolio something that is done "with and for" students. Chappell & Schermerhorn (1999) look at the history of portfolios as:

> Used traditionally in areas such as fine arts and photography as actual physical portfolios of students' works, career portfolios have attracted increasing attention in other academic and occupational areas (Porter & Cleland, 1995; Schindler, 1997; White, 1993, 1994; Williams & Hall, 1997; Yancey, 1992). Regardless of career field, a portfolio is a compendium of materials that document and demonstrate a person's accomplishments and career readiness. Whether the included materials are samples of an artist's photographs, a linguist's translations, or a management student's research projects, the objective for the individual is the same -- to demonstrate career readiness. (p. 651)

There is little mention of the faculty member's role in developing the portfolio. Kist (2000) perpetuates this traditional approach to portfolios in the electronic environment. He states, "Students would be allowed time to work on projects of their own in a kind of ongoing multimedia readers'/writers' workshop. All of this work would be kept in an electronic portfolio over the course of all of the student's years in school. Over years of schooling, each student's work would reflect an immersion in reading and writing in many forms." (p. 715) The literature iterates this traditional view of portfolios over and over. In spite of this, the paradigm has shifted.

The authors' implementation experiences within their own academic units as well as their experience working with other units indicate that a critical success factor for electronic portfolio implementation is a culture where faculty understand their central role in the portfolio process as resource providers, mentors, conveyors of standards, and definers of quality. The major obstacle to successful implementation of web-based electronic portfolios is not student readiness. It is this full faculty participation. *We have met the enemy ... and the enemy is us.* (Kelly, W., 1970, http://www.igopogo.com/we_have_met.htm)

The misunderstanding about the faculty role in the portfolio process stems from a misunderstanding about the portfolio process and is magnified when units attempt to move from paper portfolios to exploit the promise of electronic portfolios on the web. When engaged in a paper (hardcopy) portfolio process, limits on the scope of portfolios are imposed by the hardcopy media, itself. Storage considerations and dissemination for readers impose limits on the amount and type of content, the number of readers/reviewers, and the scope of the content. The hardcopy format artificially imposes

restrictive constraints on the number of participants in the portfolio process, on what each participant can do, and on what an institution can accomplish with portfolios. Unless the academic unit has only a few faculty members, the constraints of hardcopy portfolios almost assure that only part of the faculty will be involved in the portfolio review process.

When the move to electronic portfolios is contemplated, portfolio supporters quickly understand the web's promise of a rich variety of formats, unconstrained quantity and scope of content, anywhere/anytime availability, and possibilities of integrating curriculum. But, these visionaries fail to recognize the associated implications for their role and the roles of other participants. Reaping the full benefits of web-based portfolios requires a greater share of the faculty in the academic unit, perhaps all, participating in a full embrace of the webfolio processes. Successful implementation requires participant appreciation of the benefits from tight integration of curricular standards, course assignments, student responses to assignments, and mentor feedback about students' work. The faculty must understand their vital role and believe that the benefits of a web-based portfolio system are worth the costs.

To obtain their participation, it must be demonstrated to faculty that their involvement has payoff for them *and* potentially dramatic payoff for the academic unit. Benefits increase for each participant as the number of participants increase, much like the value of e-mail increases as the number users increases. Obtaining faculty participation is much easier when the academic unit is already using some type of paper portfolio process than when the unit has no experience with portfolios. In educational settings where faculty teach courses with little regard for the content relationships with other courses, a significant cultural shift is required to introduce the concept of portfolios and obtain the critical mass of participation that will allow the academic unit to achieve full benefits from a web-based portfolio system. A clear definition of the nature of the web-based portfolio system, of which the student artifacts are just one component, is a prerequisite to this culture shift. Reaping the benefits the web offers involves far more than the simple digitizing of a student's paper portfolio. Changing the academic unit's preconceptions about the nature of a web-based portfolio system is, itself, a major critical success factor.

Cultural Issue II: Broadening the definition from a portfolio of student artifacts to a collaborative web-based portfolio system

When portfolios are made electronic, faculty and students tend to collaborate in a "with and for" developmental process.

> Electronic portfolios can contain video, dialogues, simulations, links to references, and the interchanges of ideas in a chat room; they can be organized to be accessible in a searchable form; and they are useful in parallel problem solving. Portfolios can be used for student evaluation of personal learning, for program evaluation by showing the development of learners through their products to a team of evaluators, and for making archives for future generations of learners to build on. (Bull, Montgomery, Overton & Kimball, 1999, p. 1)

Faculty are less likely to do portfolios "to" students any more because a webfolio enables faculty and students to employ a "less adversarial" process. As Bartell, Bryde, Mahler, Murray-Ward, & Gathercoal (2001) testify:

> Implementation of a web-based electronic portfolio system throughout the teacher preparation program complements the student-centered approach CLU takes to preparing teachers for the classrooms of tomorrow. The portfolio system is analogous to a relational database that is cooperatively developed by faculty, students, cooperating teachers, supervisors and employers. It enables a grand conversation between these parties, focusing around the student's professional development. The [California] state standards and the School of Education's conceptual framework of reflective, principled practice serve as a scaffold around which teacher educators and preservice teachers weave their dialog. (p. 5)

The next several years will see it routine for students to place their completed course assignments on the WWW for faculty to access. Most will not deny this; yet, implicit in the acceptance of this new situation may be an incorrect vision that the webfolio will be a traditional portfolio, simply digitized. With this incorrect vision in place, faculty will dismiss the proposition of a webfolio as yet another failed attempt at integrating technology into the "true" culture of education. Unless there is a shift in the educational unit's culture, the unit's educators run the risk of becoming a leading force in the "neo-Luddite" movement Kurzweil predicts will grow in the year 2009.

Disciplines that lack commitment to careful curriculum design will find this shortcoming magnified when attempting to move to a web-based portfolio system where curricular content makes up a significant part of the webfolio content. The maximum benefit from a web-based portfolio system is realized when the existing curriculum is an integrated set of courses designed to develop course specific standards in a fashion that logically results in student mastery of program standards. The standards may be mandated by state law and/or defined by the faculty of the academic unit. Curricular prerequisites for use of a webfolio system described here are more likely to be met by educational units that are concerned with precise curriculum design.

A Web-Based Portfolio System

Although a professor, acting alone, can have his or her students use the portfolio system for a single course, additional benefits for students and faculty in the academic unit are achieved when there is substantial portion of the faculty involved. Faculty and students can see the standards and the way they are achieved by students as they progress through the curriculum. All participants have a greater awareness of the content of courses besides the ones they are currently taking or teaching, which makes integration of course content easier. Faculty who develop high-quality standard modules can share them with faculty teaching other sections of the same course. The start-up cost of learning how to use the system is the same whether the student uses the system for a single course or many courses, but the benefits are cumulative with each additional

course. Therefore, it is easier to justify incurring the fixed training costs if the student uses the system for multiple classes.

There are many benefits associated with the implementation of web-based portfolios in education. The most immediate physical benefit of a webfolio system is the elimination of physical storage problems associated with traditional portfolios. The webfolio allows students to house artifacts in a virtual environment. No longer will they need to transport and pick-up their artifacts from the instructor. The instructor can simply tap into their webfolio, view and comment on the artifacts any time and any place where there is access to the WWW. Webfolios can be shared widely with others. Students can send an email message with a URL embedded and anyone in the world can have access to their webfolio. Webfolios can serve as working portfolios, development portfolios or showcase portfolios. Students have complete control over what artifacts are displayed and who is able to see them. They can have a working portfolio generating artifacts only they can view, a developmental portfolio they share with faculty and a showcase portfolio they share with the world.

A webfolio system allows for creative thinking and collaboration with others. Students are not confined by the limitations of paper. They have the resources of the WWW available to them and they can confer and collaborate with anyone else in the world. Students can display graphics, sound, digital video, text and other presentation media. The possibilities are virtually limitless and only confined to the student's imagination.

The webfolio invites self-evaluation and reflection. Students are encouraged to take a heuristic viewpoint and examine each artifact placed in the portfolio. Faculty, when given access, can give reflective feedback to the student and then the student can respond by altering the artifact or by dismissing the faculty members' comment. The student could solicit feedback from other faculty members and get a second opinion on the artifact before deciding what to do with the piece. The webfolio will allow students to construct their own truth, reflecting on each artifact with many mirrors (their peers, faculty, employers, supervisors and significant others).

The webfolio irreversibly changes the faculty members' role and the role of the student. No longer is the student simply the recipient of information; the student is actively involved in constructing meaning by generating and displaying for others their real world responses to questions and assignments raised in a course or program of study. The faculty member no longer simply imparts information, but helps the student construct meaning through facilitating and coordinating the learning environment. The webfolio is truly a form of authentic assessment and it matches up well with methods and strategies that complement constructivist philosophies. Being familiar with the enhanced communications embedded in the development of a web-based portfolio system will help faculty to understand the importance of their participation in the webfolio development process.

Figure 1 shows the tight integration and enhanced communications embedded in the web-based portfolio system.

Figure 1. Interaction between Webfolio, faculty, students, and mentors.

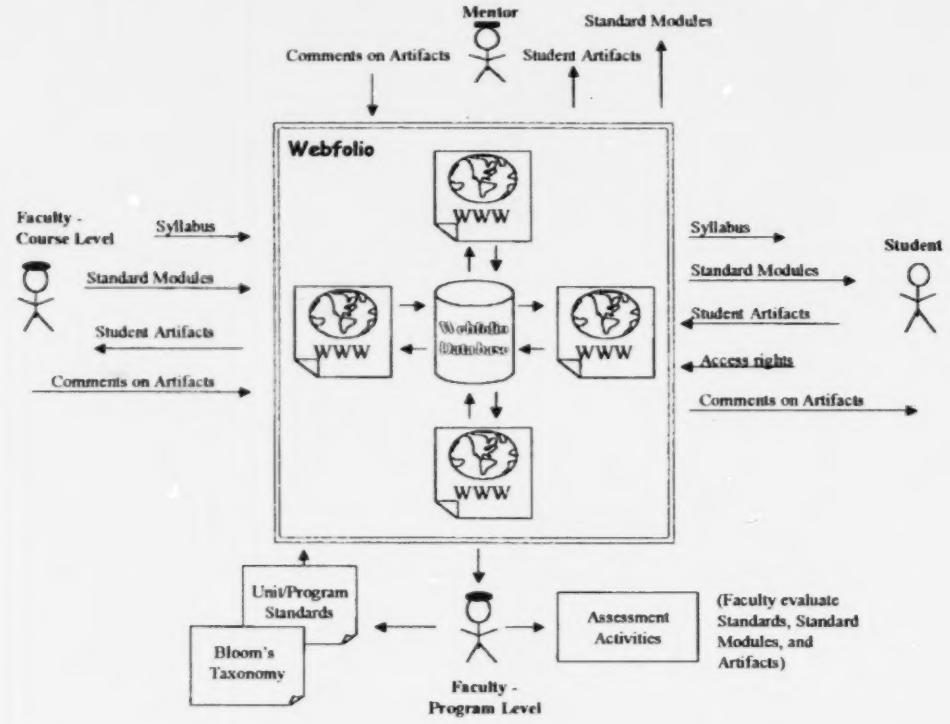


Figure 1. Model of interaction and communication between a webfolio system and students, faculty, mentors, standards, artifacts, and comments on artifacts.

Faculty convey standards to the students through the webfolio by displaying a syllabus, complete with standard modules (Standard modules are described in detail in the next paragraph). A student's response to a standard module is manifest in a multimedia artifact that is displayed in the student's webfolio and that artifact represents the student's level of mastery of the standard. After the student allows instructor access to the artifact, the instructor provides feedback in the form of a narrative (inclusive of both quantitative and qualitative comments) and this feedback is displayed in a comment log that can be viewed by the student. Instructor feedback can be displayed as multimedia comments, too. Supervisors and other mentors may also view the artifact and add feedback to the log, but only if the student has given them access to the artifact. Based on the feedback given by the instructor and other mentors, the student can revise his or her work resulting in a modified artifact. Then, the instructor and other mentors can view each other's feedback and make additional comments on the modified artifact. The process can be iterated until the student, instructor, and mentors are satisfied that the student has mastered the standard. The webfolio processes can support both formative and summative assessments of student work at a course and program level.

For each standard module, instructors generate:

1. a statement of the standard,
2. a student assignment,

3. detail/help/Internet resource links,
4. an assessment description, and
5. metadata.

The standard module is structured in such a way that when completed by the student, each response results in an artifact that becomes a part of the student's portfolio. The artifact indicates the level of the student's mastery of that standard. The (1) statement of the standard gives a title to the standard. Instructors commonly use this title in their syllabus to refer to specific assignments. The (2) student assignment is a piece of expository text that gives students direction as they continue their study and generate an academic response to the standard. These, too, are generally embedded in the instructor's syllabus or the professional program documentation. The (3) Detail/Help/Internet resource links section provides additional detail about the student assignment. It may include relevant lecture materials (PowerPoint presentations, pictures, diagrams, audio and video, notes and outlines). It can display links to resources found on the Internet. This section of the standard module allows the vast resources of the Internet to be mined and exploited as instructors and students identify links specific to the standard to be mastered. This benefit of the webfolio database's organization cannot be overstated. As Internet resources are identified, the instructor can update them at any time and all students will have instant access to the updates. The (4) assessment description section of a standard module conveys how the artifact can be used to self-assess the student's mastery and/or how instructors and mentors will assess the level of student mastery. The (5) metadata (data about a standard module) are variables pertinent to a particular professor or academic unit. They are indications from instructors as to how specific standard modules fit within a curricular context. For example, on the instructor level, the instructor nominates how the standard module matches a particular level in Bloom's taxonomy and on the academic unit level, instructors indicate how a particular standard module relates to measures of mastery aligned with a professional program's conceptual framework. The purpose of adding metadata to the standard module is that it can be used to generate hierarchical listings of standard modules based on Bloom's taxonomy, or an academic unit can analyze its curriculum to determine if its conceptual framework is incongruent with the curriculum at work. This curriculum analysis represents a point in time or the curriculum over time since all standard modules are maintained over time within the same database. For academic units who are held responsible to accrediting agencies, this aspect of the standard module development simplifies compilation of curriculum and assessment documentation.

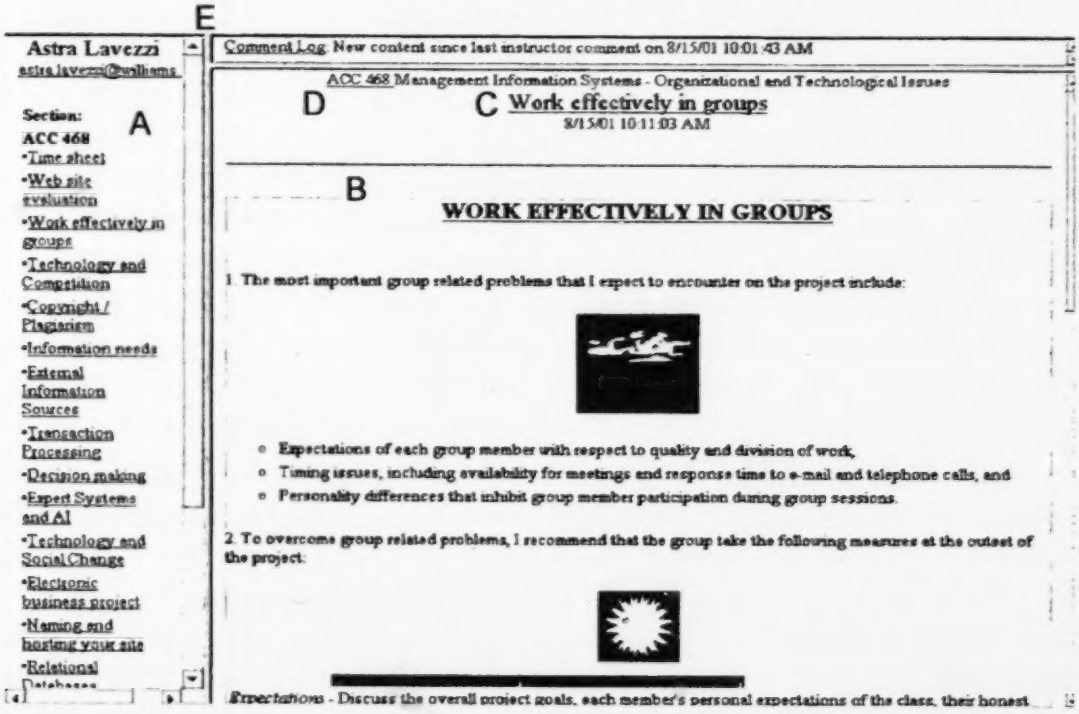
The portfolio system also allows for categories of standards that are not associated with a specific course. Professional programs that require a portfolio containing a summative assessment of student work can include the multiple parts of the defense as a category. A pilot application of the webfolio system at Illinois State University is using a non-course "student life" category to collect student life activities such as leadership and effective team membership.

When a student enrolls in a course, he or she adds the course's syllabus and associated standard modules to his or her portfolio. Then, he or she responds to the standard modules as the course progresses.

In summary, the major elements of the web-based student portfolio system are the instructor provided syllabus and associated standard modules, the student produced artifacts, and the logs of instructor and mentor feedback.

So, what does this all look like? Figure 2. shows an instructor's view of a student's portfolio. A student's view of his or her portfolio is similar.

Figure 2. Instructor Viewing a Student's Webfolio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C Work effectively in groups
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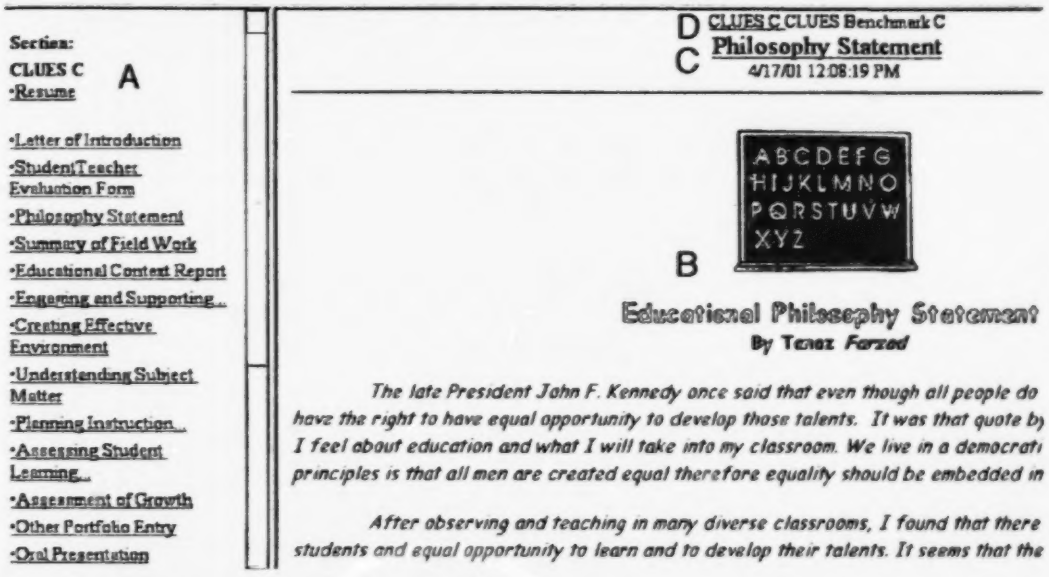
WORK EFFECTIVELY IN GROUPS
1. The most important group related problems that I expect to encounter on the project include:
Expectations of each group member with respect to quality and division of work,
Timing issues, including availability for meetings and response time to e-mail and telephone calls, and
Personality differences that inhibit group member participation during group sessions.
2. To overcome group related problems, I recommend that the group take the following measures at the outset of the project:
Expectations - Discuss the overall project goals, each member's personal expectations of the class, their honest

Figure 2. The view an instructor or mentor has of a student's portfolio in webfolio.

The portfolio system extracts content labeled A through E in Figure #2 from the database and constructs the page. The left frame (A) contains the contents listing for Astra Levezzi's portfolio. The professor is currently viewing her artifact (B) representing her response to the "Work effectively in groups" standard. The standard module containing the Student Assignment, Detail/Help/Internet Resources, and Assessment Description can be obtained by clicking link (C). The syllabus for the course is obtained through a link (D). Feedback about the artifact made by the instructor and mentors are contained in a log that is viewed by clicking on link (E). The metadata provided by the course instructor are not available from this view.

Figure 3. shows the listing of contents for a student that has completed several courses as well as non-course California Lutheran University Education Students (CLUES) C standard modules.

Figure 3. Anyone with WWW Access Viewing a Student's Webfolio


Section:
CLUES C
•Resume
A
•Letter of Introduction
•Student Teacher Evaluation Form
•Philosophy Statement
•Summary of Field Work
•Educational Content Report
•Engaging and Supporting...
•Creating Effective Environment
•Understanding Subject Matter
•Planning Instruction...
•Assessing Student Learning...
•Assessment of Growth
•Other Portfolio Entry
•Oral Presentation
D
C
CLUES C CLUES Benchmark C
Philosophy Statement
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B
Educational Philosophy Statement
By Tenaz Farzad
The late President John F. Kennedy once said that even though all people do
have the right to have equal opportunity to develop those talents. It was that quote by
I feel about education and what I will take into my classroom. We live in a democrati
principles is that all men are created equal therefore equality should be embedded in
After observing and teaching in many diverse classrooms, I found that there
students and equal opportunity to learn and to develop their talents. It seems that the

Figure 3. The view anyone in the world has of a student's webfolio.

The left frame (A) displays the CLUES benchmark "C" standard modules. The main frame (B) holds the student's response to the standard module "Philosophy Statement" which is displayed by clicking on the link by the same name in the left frame (A). As with the previous example, the standard module containing the Student Assignment, Detail/Help/Internet Resources, and Assessment Description can be obtained by clicking link (C) and the program documentation for "CLUES C" can be viewed by clicking on link (D). With the exception of the instructor and mentor feedback logs, everyone in the world with the correct URL and student-granted access rights can view a student's webfolio.

Implementation Strategies and Critical Success Factors

This section will help other faculty and academic units to determine whether they should attempt to implement a web-based portfolio system and whether the implementation should involve an entire academic unit or simply an individual faculty member acting independently. The authors provide a description of their implementation strategies at the class level as well as at the academic unit level. They provide a checklist to help faculty and academic units decide whether to proceed with implementation and planning and whether to attempt this at an individual faculty or academic unit level. The authors address the processes and problems associated with implementing a webfolio system and discuss critical success factors in light of what they know about the infusion

of technology into teaching and learning and the successful implementation process used at California Lutheran University's (CLU) School of Education (SOE).

Our collective experience has informed us of Critical Success Factors (Table 1) that need to be present and active in order to implement a webfolio system. Column one of the table is provided to refer to factors when discussing implementation strategies. It does not indicate importance since all factors listed are required for success. Column two describes the factor; column three provides sub-descriptors and column four indicates by using a check mark (✓) if the factor is needed for single faculty implementation only. All factors listed are needed for successful academic unit implementation.

Table1. Critical Factors for Successful Implementation

#	Critical Factor	Sub-descriptors and Needed Operators	✓
1	Information Services Cooperation	Information Services can support the Internet traffic to and from the webfolio server.	✓
2	Administrative Support	Administration rewards participants.	
		Faculty participants are not punished for negative impact on student evaluations of teaching. (A small portion of students will "punish" teachers for new course requirements involving technology)	✓
		Dollars are committed to the various requirements indicated in the checklist.	
3	Technology Infrastructure	All participants have Internet access.	✓
		All classrooms have Internet access with computer display projection units	✓
4	Portfolio Culture	Students complete paper portfolios as a program requirement.	
		Students complete paper portfolios as requirements in courses. The portfolios carry a significant weight in determining the course grade.	✓
		The student's work in the portfolio "defines" the student to faculty and recruiters.	✓
		Multiple faculty/supervisors/mentors read and comment on students portfolio work.	
5	Student Learning Centered Culture	Faculty members routinely give students assignments in written form.	✓
		Students routinely address unstructured problems.	✓
		Faculty grade and provide feedback on students work.	✓
6	Implementing force and project champions	The push for adoption and implementation of webfolios comes from faculty.	
		There is a group of faculty members who have the commitment and stamina to make the webfolio system work.	

7	Implementation milestones	An implementation plan with reasonable milestones that are measurable and that collectively lead to full implementation.	
8	Training and Help Resources	Open computer lab assistance available for students and faculty.	
		Faculty/Mentor training (multiple times and places).	
		Webfolio documentation available for faculty/mentors and students.	✓
9	Faculty members believe webfolios will make a difference in the quality of education and they understand their role and commit to it.	Faculty commit to casting course assignments into a uniform format such as: ✓ Statement of standard ✓ Student Assignment ✓ Detail/Help/Internet Resources ✓ Assessment Description	✓
		Teams of faculty agree to cast program standards into a uniform format including an artifact producing activity demonstrating mastery of program standard modules.	
10	Standards or Competency Based Curriculum	The academic unit has explicit program standards. Law may mandate these standards or they may be recommended by professional organizations or the academic unit may define them independently.	
11	Integrated Curriculum developed by teams of faculty	Faculty teams periodically review and revise the content of the curriculum and are aware of the content of courses making up the entire program.	
		Courses and/or program requirements are designed and sequenced to build student mastery of standards.	
12	Supervisors and Mentors use the webfolio to provide feedback	Multiple perspectives are represented in the feedback to students.	
		Students value the varied feedback received from multiple sources.	
		Students and Mentors thrive on ambiguity as feedback defines more shades of gray than defining lines.	

Assuming an adequate technology infrastructure (factors 1 and 3), a Webfolio System where students produce artifacts in response to standard modules developed by faculty is a logical evolution of the process involving paper portfolios. The process of providing comments from faculty and other mentors to the students also is a logical evolution. Although logical, the process described requires a much greater role for faculty in terms of the number of faculty participating in the process and the nature of the participation. To begin the process, faculty members provide a syllabus, complete with standard modules consisting of a Statement of the Standard, Student Assignment, Detail/Help/Internet Resources, Assessment Description and Metadata (factors 9, 10, and 11). In addition, they incorporate the standard modules in their class meetings, examine

and assess the artifacts produced by students, and provide students with feedback (factors 5 and 12). The question remains, how do we get from the current point in time when most faculty choose not to use this kind of technology to the webfolio system we have described above? As we have repeatedly reminded the reader, the culture of some academic units will hinder the unit-wide implementation of a webfolio system (factor 4), but will not prevent individual faculty from beginning on their own.

Sandholtz, Ringstaff & Dwyer (1997) indicate that faculty will not use technology unless they **believe** it will make a difference in the quality of education provided to their students. This is number one on the list of imperatives for implementing the webfolio; convincing faculty that implementation is in the best interests of the students at the university or college (factor 9). At the same time, there needs to be an "implementing force" that drives faculty to simply consider this proposition (factor 6) (Gathercoal, 1991). An implementing force can be an idea, a policy, resources or some other motivating stimulus. Usually, affecting faculty beliefs will go hand-in-glove with establishing an implementing force, but this need not always be true.

At CLU's SOE the implementing force was a successful "Preparing Tomorrow's Teachers to Use Technology" grant from the U.S. Department of Education. Prior to submitting the grant, the authors took its contents to a Teacher Preparation Department meeting and presented all the goals and objectives of the grant for faculty approval. Each goal was read and displayed and every faculty member was asked whether he or she could live with the goal or objective or whether it needed changing. One of the objectives read: *To establish and use throughout the undergraduate and graduate programs an electronic portfolio system that addresses specific competencies in the various disciplines and in the Teacher Preparation Program*. This objective passed the meeting unchallenged. This tacit approval from faculty and concomitant grant award provided the SOE with its implementing force and belief system that the webfolio would work to benefit the education of all its students.

Faculty beliefs need to be addressed first and they need to be addressed often. The implementation process cannot address faculty beliefs once and think that it is finished. Faculty will question the use of technology every step of the way. Those responsible for the implementation must be knowledgeable of reasons why this technology is good for education and how it works in the best interests of students.

At CLU's SOE the initial implementing force and "adaptation" of faculty beliefs was short-lived. Beginning the second year of the grant initiatives, faculty in the Teacher Preparation Program raised the question, "What proof do we have that this technology is enhancing the teaching and learning of our students?" This question was addressed at the first technology-training meeting of faculty and information regarding the benefits of the infusion of technology into teaching and learning was provided. Faculty once again came to terms with their beliefs and endeavored to implement the webfolio for the second year of the grant. Faculty in the SOE seem to believe that the webfolio is a good use of technology in education and all are prepared to move into the third year of the grant and use the webfolio throughout the program.

While continually addressing faculty beliefs and establishing an implementing force, the next step is to break the implementation down into incremental units with realistic definitions of success (factor 7). Do not try to do everything at once. It is best to

start small and then expand. It will take time, so be patient. If there is not an existing "portfolio culture," it may take years.

At CLU's SOE, webfolio implementation began with two classes of preservice teachers. The first semester, both students and faculty learned much about the webfolio and they were able to apply what they learned while advancing the effort the following semester. The next semester, involved twice as many students and faculty, and by the end of the second year all full-time students and faculty in the Teacher Preparation Program were using the webfolio. As the SOE begins year three of the grant, it is expected that all Teacher Preparation Department faculty and students will be using the webfolio.

Resource allocation and reallocation is critical to the implementation process. The implementation process will need institutional backing and credentials (factor 2). The administration needs to "anoint" the process and its people and ensure that all who are involved know that the implementation process is "approved." Although the project has many "champions" at CLU, including the Dean, the chair of the department, and dedicated faculty in the SOE, it helps to give the process a name. At CLU, the project is called, "MAGNETIC CONNECTIONS" and the "newly named" process champions are called "Director," "Clinical Faculty," "Curriculum Coordinator" and "Open Lab Assistant." When the implementation process and its people are given titles and names they are immediately recognized by the institution and the process finds a quick way of explaining away things that may not make immediate sense. For example, when it is announced that the Clinical Faculty will be team-teaching with Teacher Preparation Department faculty, there are few questions asked about why or what. Simply mentioning the name Clinical Faculty brings back visions of a commitment made to the implementation of the webfolio.

Successful implementation will demand that regular meetings are held to provide faculty with the concepts and skills for successful implementation (factor 8). All faculty need to attend these professional development meetings, and there must be multiple sessions to accommodate the varied schedules of faculty. The meetings should address both theory and practice. The meetings should be held during regular teaching hours and the faculty should be compensated for their participation. Webfolio implementation at CLU's SOE involved consultants coming in twice a year to conduct intensive training in the use of the webfolio. As well, technology workshops and curriculum revision meetings were held throughout the year. Faculty participated in an average of 31 hours of professional development meetings and they were paid for their time and their work on the grant initiatives.

Chappell & Schermerhorn (1999) suggest five rules for implementation of electronic portfolios.

> Rule 1: Electronic portfolio programs should be mandatory if they are to overcome resistance on the part of many students who remain technically adverse…
> Rule 2: Students must not be able to opt out of the program due to deficiencies in their computer skills. These students must be encouraged to recognize their computer shortcomings and catch up on their own time, with the help of computer lab assistants…

> Rule 3: Students need to be challenged and encouraged to select their own materials to include in the ESPs, as long as the required content areas are covered...
> Rule 4: The portfolio program must run under defined deadlines, with regular feedback to students. The provision of successful examples early in the process is helpful...
> Rule 5: "Portfolio champions" must be involved from the initiation of the program to ensure success and foster imitation. (p.658-660)

When implementing the webfolio, CLU's SOE found that these rules were good caveats; but strictly enforcing them was not a good idea. Respecting students' and faculties' needs and different learning styles and the speed with which they come to terms with this new situation need to be valued. For example, some faculty and students were simply "pushed out" of the Teacher Preparation Program because of the webfolio. These were generally less technologically experienced faculty and students who thought that they could do their job without coming to terms with technology, in general. It will always be an open question whether their leaving the program was a good thing, or whether the technology should have had less importance. Holding a strict posture on these issues will certainly affect the culture of the institution and "push" some out of education for good. CLU's SOE took a mentoring posture and helped faculty and students to move on gracefully.

This paper elucidates the critical success factors that must be in place in order for an entire academic unit or individual faculty member to implement a web-based electronic portfolio system. Principal to the process is the individual faculty's beliefs about technology and assessment practices. Faculty must vacate the idea that portfolios are something that is done "to" students and embrace the notion that the webfolio process is something that is done "with and for" students. A well-designed curriculum embedded in a webfolio system, conveying academic standards, appropriate resources and providing vehicles for faculty mentoring, enables students' development and upkeep of developmental, growth and showcase portfolios at once. A web-based electronic portfolio system acknowledges and appreciates the intrinsic links between student assessment, faculty and program evaluation and the meaningful reporting of assessments and evaluations to interested third parties. Upon graduation, the student will have a portfolio demonstrating her or his mastery of curricular standards, all displayed as unique educational experiences at the college or university. As web-based portfolio systems facilitate assessment, evaluation and reporting in a single web portal, the most limiting factor surrounding the implementation of a web-based electronic portfolio system will be lack of vision and "creative imagineering."

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